《論　説》

MERCOSUR AND INTERNATIONAL TRADE

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I. Introduction

In the postwar period, the General Agreement on Tariffs and Trade (GATT), the World Trade Organization (WTO), and the International Monetary Fund (IMF) were established to promote international trade and finance, and they've had much success in contributing to world economic stability and growth. On the other hand, regional economic, trade, and currency blocs have emerged, and such formations are ongoing throughout the world. The EEC (European Economic Community), EFTA (European Free Trade Area), NAFTA (North American Free Trade Agreement), and MERCOSUR (Mercado Común del Cono Sur) are typical examples. In Asia, AFTA (Asian Free Trade Agreement) is in the planning stage.

Here, our focus is on MERCOSUR. This market comprising Argentina, Brazil, Paraguay, and Uruguay was established on Jan. 1, 1995. The history of MERCOSUR goes back to the foundation of LAFTA (Latin American Free Trade Agreement) in 1959. LAFTA's progress was poor; accumulating debts and deficits deteriorated economic conditions in the 1970s and 1980s. Once having entered the 1990s, however, the countries of central and south America developed economically. MERCOSUR is also maturing. In 1994, the currency crisis

in Mexico affected some countries for some time; yet they could recover via tight fiscal policies or IMF financing. The inflation rate is stable now[1], and rapid currency depreciation has halted. MERCOSUR's trade volume, especially that among its members, has increased rapidly in tandem with the economic recovery. Bolivia and Chile became associate members in 1996, and a free-trade agreement was jointly signed by MERCOSUR and Chile. MERCOSUR is also working out free trade agreements with the EU, the SADC (Southern African Development Community), and the Andean Community. Developed countries are not only paying attention to MERCOSUR's labor force but also to its ample natural resources (IMF, 1994, 1999).

In 1999, eleven EU countries realized the single currency called the euro. There were many motivations for the move, both economical and political. But one of the euro's central purposes was to eliminate exchange rate fluctuations. In MERCOSUR as well, some have insisted on introducing a common currency[2] to counter the exchange rate fluctuations that are becoming a serious problem there. Recently, Brazil was gravely affected[3]; exchange rate variability risks reduction in trade volumes and severely deteriorates economic development.

Thus it's fitting that the exchange rate/trade relationship be analyzed, and while much has been accomplished in this area, with many excellent papers being presented, there have been few analyses focusing on MERCOSUR. Moreover, some economists who have examined currency crises say that currency contagions occurring in the 1990s particularly are related via economic linkages. Trade linkages also may play an important part in setting off currency contagions.

The objectives of this paper are as follows. First, we investigate whether the elimination of exchange rate fluctuations has coincided with

the increasing volume of international trade. Second, we analyze the relationship between trade linkages and currency crises. We also analyze whether the increase of trade linkages in fact shapes an optimum currency zone. Section 2 below discusses the econometric methodology for evaluating the relationship between exchange rate variability and trade. Section 3 considers whether trade linkages are susceptible to currency crisis contagion and whether they promote an optimum currency zone. Finally, Section 4 provides some concluding remarks.

II. MERCOSUR and International Trade

Much research has gone into the relationship between exchange rate variability and trade, especially for exports to outside areas. De Grauwe (1988), Frankel (1991), Giovannini (1988), Viaene and de Vries (1992) indicate that exchange rate variability reduces trade, based on their theoretical model. Arize (1995), Chowdhury (1993), De Grauwe (1987), Kenen and Rodrik (1986), Pozo (1992) use empirical analysis to illustrate the same result. On the other hand, Asseery and Peel (1991) and IMF (1984) take the opposite tack that exchange rate fluctuation increases trade. Then there are Bailey et al. (1986), Gagnon (1993), Gotur (1985) who find no significant relationship between exchange rate variability and trade. Regardless of these mixed conclusions, there is little research available on MERCOSUR.

To determine the relationship between exchange rate fluctuation and trade, let's examine the equation (1) below. This is a traditional long-term export function (for example, see Arize, 1995 and Chowdhury, 1993):

$$\ln X_t = \alpha_0 + \alpha_1 E_t + \alpha_2 \ln Y_t + \alpha_3 \ln P_t + \varepsilon_t \qquad (1)$$

where X_t stands for real exports, E_t for exchange rate variability, Y_t for real foreign income, P_t for relative prices (domestic/foreign), and ε_t is the error term.

Economic theory states that if importers are risk averse, then the increase of exchange rate variability increases the uncertainty of profitability, which depresses trade. The net income on actual exports should be positive, and the impact of relative prices on actual exports should be negative.

Cointegrating the variables in equation (1) produces the following error-correction model:

$$\Delta \ln X_t = \alpha_0 + \alpha_1 ECT_{t-1} + \alpha_2 MERCOSUR_t + \Sigma \beta_i \Delta \ln X_{t-i} + \Sigma \gamma_i \Delta E_{t-i} + \Sigma \delta_i \Delta \ln Y_{t-i} + \Delta \zeta_i \Delta \ln P_{t-i} + \varepsilon_t \quad (2)$$

where ECT_{t-1} is the error-correction term and $MERCOSUR_t$ is a dummy variable that takes the value of "one" when the exporting country is a member of MERCOSUR.

To measure exchange rate volatility, we used the moving standard deviation of the growth rate of the nominal exchange rate, following Chowdhury (1993), Fountas and Aristotelous (1999).

$$E_t = [(1 / m) \Sigma (\ln T_{t+i-1} - \ln T_{t+i-2})^2]^{1/2} \quad (3)$$

As shown above, T is the nominal exchange rate and m is the order of the moving average, which we set to 8. We use quarterly data for this exchange rate calculation and convert it into an annual-basis figure.

Here we use yearly data[4] in evaluating the equation (2). We examine four MERCOSUR countries, excluding the time of the fixed exchange

rate system from our sample period because we cannot analyze the effects of exchange rate volatility. The export variable includes each country's exports to the other three countries, and its actual value is determined through division by the unit export value. Taking the weighted average of the real GDP (nominal GDP is deflated by the consumer price index) creates foreign income. Relative prices are the exchange rate adjusted price of the domestic country's exports compared to the export prices of the other three countries. The weights are identical to the income. All data excluding that for trade is from the IFS (IMF), and the trade data is from the Direction of Trade Statistics (IMF).

First we made unit root tests to observe the properties of each time series. The results say that all series are I (1). Then we tested for cointegration by the Johansen maximum likelihood approach. The results indicate that there exists a unique cointegrating vector for Argentina, but not for Brazil, Uruguay, and Paraguay. And to decide the forms of the model, we used the AIC2 rule and eliminated insignificant lags unless this introduced a serial correlation in the error term ε. We included an error correction term only for Argentina and not for the other three countries, since cointegration does not apply to them. The sample period is from 1975 to 1996, and the result is Table 1.

The table shows that exchange rate variability has a negative impact on exporting. And the other results are not surprising. However, the dummy variable (MERCOSUR) is not statistically significant. The foundation of MERCOSUR does not play an important role in promoting international trade in this area. Between these countries, trade linkages have been strong since the foundation of LAFTA in 1959 and have continued to develop. Surely MERCOSUR has helped to promote intra-trade (the coefficient is positive), but from the time of its foundation the

Table 1: Regression results for the determinants of trade

Country	Lag	ECT	MERCOSUR	Δ X	Δ E	Δ Y	Δ P	Other Statistics
Argentina	0		0.06 (0.85)					Adj.R^2=0.64 AR=1.32 ARCH=0.65
	1	–0.85 (6.95*)		–0.55 (–5.44**)	–1.98 (2.24*)	0.66 (2.10*)		
	2			–0.47 (–7.81**)		0.68 (3.08**)	–0.51 (–0.98)	
Brazil	0		0.04 (0.48)					Adj.R^2=0.60 AR=1.75 ARCH=0.53
	1			–0.74 (–8.50**)	–8.99 (–4.68**)	0.49 (2.30*)		
	2			–0.66 (–8.54**)	–20.95 (–6.94**)		–0.65 (–1.44)	
Uruguay	0		0.09 (1.44)	–0.57 (–5.52**)				Adj.R^2=0.75 AR=1.32 ARCH=0.16
	1			–0.43 (–3.97**)	–1.54 (–1.28)	0.55 (1.29)	–0.08 (–0.17)	
Paraguay	0		0.11 (1.21)		–3.68 (–2.78**)			Adj.R^2=0.66 AR=1.55 ARCH=0.38
	1			–0.62 (–6.51**)	–0.01 (–1.05)	1.01 (3.63**)		
	2			–0.58 (–6.59**)	0.02 (0.47)		0.38 (1.30)	

Note: figures in parentheses are absolute t-statistics. * and ** denote significant at the 5% and 1% level respectively. The F statistic version of LM (4) test statistic for autocorrelation (AR) and LM (4) test statistics for autoregressive conditional heteroskedasticity (ARCH) are reported.

development of intra-trade did not change dramatically. In fact, some treaties to promote free trade had already been put into place[5], creating a free-trade zone before MERCOSUR itself was established.

III. Trade and Currency Contagion

Not a few excellent currency crisis analyses have been published, particularly following the currency crises in Asia. Within academic circles, most economists view currency crises as either stemming from

differences of fundamentals or as self-fulfilling speculative attacks[6]. But while recent currency crises have tended to be regional, macroeconomic conditions do not follow that same trend. And while self-fulfilling speculative attacks do have some effect in setting off currency crises, we think there might be other factors involved.

In section 2 we illustrated that the elimination of exchange rate variability would promote international trade. Exchange rate variability in MERCOSUR has been decreasing. Table 2 shows the exchange rate variability in MERCOSUR countries.

If the reduction of exchange rate variability promotes trade, might it also lead to currency contagion? Trade patterns tend toward the regional. Most countries usually trade with other nations in geographic proximity, and trade volumes have continued to rise. In the process of shaping MERCOSUR, trade tariffs and quotas have been eliminated in this zone, and this movement has enforced economic linkages while continuing to increase trade. It is possible that trade linkages relate to currency contagion in ways other than the fundamental ones.

We will demonstrate that trade linkages have an important influence on currency contagion above and beyond the macroeconomic or financial similarities among affected countries, especially in the middle- and long-term. We analyze two currency crises, one in 1994 and the other in 1997,

Table 2: Standard deviation of the change of nominal effective exchange rate

Country	Argentina	Brazil	Paraguay	Uruguay
1972–1985	3.568	4.652	3.597	2.518
1985–1997	3.298	4.298	3.266	2.111

Note) The weights are trade share in MERCOSUR. Data source is in Appendix.

of course focusing on MERCOSUR countries but also including Bolivia and Chile. These two nations are applying for membership in MERCOSUR and their linkage with the organization has been strong. The 1994 currency crisis in Mexico impacted Brazil and it also caught Paraguay and Chile. The 1997 currency crisis began in Thailand, attacked Brazil, and impacted Argentina and Bolivia[7].

Next, we qualify the trade links between the first attacked country and the others. Our calculation of trade linkage, based on Glick and Rose (1998), is as follows:

$$\text{Trade Linkage}_i \equiv \Sigma_k \{[(X_{ok} + X_{ik}) / (X_o + X_i)] [1 - | \{(X_{ok} / X_o) - (X_{ik} / X_i)\} | \{(X_{ok} / X_o) + (X_{ik} / X_i)\}]\} \quad (4)$$

where X denotes exports, while o, i and k are countries, o being the first victim of the currency contagion. We use Brazil for two cases. For example, X_{ik} denotes bilateral exporting from i to k. The trade calculation is made using annual data from the IMF's Direction of Trade Statistics.

We must take into account the macroeconomic or financial imbalances that may cause a currency crisis. The explanatory variables of our empirical analysis include the interest rate, domestic credit, the government budget as a percentage of GDP (a surplus being positive), the current account as a percentage of GDP, the growth rate of real GDP, the ratio of M_2 to international reserves, and the consumer price index. The interest rate is the difference between the domestic trade partner and the anchor country (Brazil). We also consider the degree of currency depreciation, constructing our index as follows. Our annual real exchange-rate index is a weighted sum of bilateral real exchange rates

(using CPI) applied to the currencies of other MERCOSUR trading partners. The weights sum to "one" and are proportional to the bilateral export shares. The degree of currency under valuation is defined as the percentage change in the index between the average of the three prior years and the episode year. All the data has been obtained from the IFS (IMF).

Our regression equation is as follows:

$$\text{Crisis}_i = \alpha_i + \beta_i \, (\, \text{Trade Linkage}_i, F_i \,) + \varepsilon_i \qquad (5)$$

where Crisis_i is an indicator defined as "unity" if country i was attacked, and "zero" if the country was not attacked. F_i is a set of macroeconomic or financial variables, β is the corresponding vector, and ε is a normally distributed disturbance.

We have created this equation via maximum likelihood by probit analysis that includes "trade linkage" and a set of macroeconomic and financial variables.

In order to identify the reason for currency crisis pressures, we use the one-step-ahead probability of a crisis as a function of pressure indicators. The equation we use is (6) below. Y is a discrete variable, which becomes "one" if there is a currency crisis and takes "zero" if no currency crisis occurred. The probability was estimated as follows:

$$\pi = \text{prob} \, (\, Y = 1 \,) = \pi \, [\, \text{Trade Linkage}, F \,] \qquad (6)$$

We cannot obtain all the data that we require for a complete empirical analysis, so the sample period is different for each country. For Paraguay, we could not obtain interest rate data prior to 1990, so we omitted it in

Table 3a: Probit results with trade, and macro and financial controls

Variables	Argentina	Bolivia	Chile	Paraguay	Uruguay
Constant	–0.884 (–0.06)	15.38 (0.87)	–50.68 (–1.24)	–0.568 (–0.29)	105.62 (2.22*)
Trade linkage	1.144 (2.82**)	0.677 (1.50)	1.682 (23.67**)	0.668 (4.23**)	0.28 (0.46)
Interest rate	0.015 (1.49)	0.354 (4.90**)	9.684 (1.40)		0.56 (3.29**)
Domestic product	–0.028 (–0.09)	0.09 (0.06)	0.17 (0.25)	–0.05 (–0.31)	–0.59 (–1.02)
Budget/GDP	–0.16 (–1.02)	–0.55 (–2.21*)	–0.14 (–5.62**)	0.03 (0.40)	–0.01 (–0.03)
Current account/GDP	–1.08 (–1.05)	–0.95 (–0.55)	–0.12 (–0.46)	0.08 (0.97)	–0.001 (–0.02)
Growth rate	–0.06 (–0.04)	0.005 (0.01)	–0.07 (–0.21)	0.89 (0.32)	0.14 (0.99)
M2/reserves	–0.62 (–1.22)	0.26 (–0.79)	0.03 (0.19)	–0.48 (–0.29)	1.05 (1.01)
CPI	2.69 (7.80**)	5.29 (8.62**)	1.08 (1.02)	0.81 (0.85)	–1.33 (–1.05)
depreciation	3.628 (4.628**)	2.039 (1.456)	3.684 (3.951**)	0.985 (0.549)	1.297 (0.759)
Adj.R^2	0.65	0.05	0.25	0.18	0.12
LR index	0.32	0.13	0.28	0.15	0.19
Sample period	1977–1997	1975-1997	1975-1997	1975–1993	1975–1997

Note) figures in parentheses are absolute t-statistics. * and ** denote significant at the 5% and 1% level. LR index is the Likelihood Ratio Index

the Paraguay equation.

We find that trade linkages and interest rates (or in some cases, budget) have a key influence on currency contagion. It is easy to predict how

Table 3b: Probability of currency crisis

	Argentina	Bolivia	Chile	Paraguay	Uruguay
1994	0.44	0.50	0.41*	0.30*	0.29
1997	0.51*	0.55*	0.42	n.a.	0.11

Note) An asterisk (*) denotes that currency crisis actually occurred.

Table 4: Trade and optimum currency area

α	β	DW	F	Adj.R^2
6.21 (4.51**)	–0.16* (–2.24*)	1.16	20.36	0.81

Note) figures in parentheses are absolute t-statistics. * and ** denote significant at the 5% and 1% level.

interest rates and depreciation affect a currency crisis; it would be all the more intriguing to identify a clear influence of trade linkages on the occurrence of currency contagion. MERCOSUR, its members tied together the way they are through trade, are naturally susceptible to certain "side effects" associated with these ties. Our empirical results show that currency contagion is a symptom of increasing trade ties. And it's important to consider this alongside the fact that such trade linkages are expanding at a brisk pace over time.

Finally, would currency integration be suitable for such a common market as MERCOSUR? To attain an optimum currency zone, the economic structures of member nations should be very similar. In the case of MERCOSUR, then, would the strong ties of trade be sufficient? We will test this notion by a simple model using the MERCOSUR member states, excluding Bolivia and Chile. The sample period is from 1975 to 1997.

We estimate a regression that takes this form:

$$\text{Correlation}_{i,j} = \alpha + \beta \text{Trade}_{ij} + \varepsilon_{ij} \qquad (7)$$

where "Correlation" denotes the relationship between country i and country j for concept manufacturing production[8]; we calculate the correlation using quarterly data on an annual basis. $\text{Trade}_{i,j}$ denotes the natural logarithm of the annual bilateral trade intensity between countries i and j in total (i or j country) trade. We consider imports plus exports as trade. Finally, ε_{ij} represents the myriad influences on bilateral activity, and α and β are the regression coefficients to be estimated.

The object of interest here is the coefficient β, which would tell us whether there is a low correlation of economic activity (in which case we would expect it to be negative), or a high correlation (in which case we would expect it to be positive). It tells us to qualify the economic importance of the effect.

The estimates indicate that a trade linkage between two MERCOSUR members is negatively associated with the economic activity between those same two countries. Thus a trade linkage between two countries is not automatically associated with more tightly correlated economic activity.

Based on this result, we can conclude that the increased trade integration among the different member countries is not correlated with economic activity in MERCOSUR as a whole. And since the optimum currency zone criterion is not satisfied, currency integration in MERCOSUR would appear to be an irrational move.

IV. Conclusion

In this study we focused on MERCOSUR, testing whether the elimination of exchange rate fluctuations have coincided with the increasing volume of international trade, and we found that this was in fact the case. Then considering the opposite results being presented elsewhere, we came to believe that the lack of depth and breadth in the financial market might have had something to do with it.

For example, in developed countries there are many financial instruments employed to hedge, cover, or speculate in money markets. But in MERCOSUR, there have been few such opportunities, so that exchange rate fluctuations are likely to have a much greater and more direct effect on international trade. Moreover, economic conditions had been quite bad within this common market, making the exchange rate variability relatively larger compared to other zones, and traders dislike such large fluctuations in the exchange rate.

Our additional purpose was to analyze the relationship between trade linkages and currency crises. We indicated that trade linkages are a key influence on currency contagion. At least in the near- and long-term, we are wise to take note of trade linkages along with macro and financial variables in examining a currency crisis.

Finally, we tested the probability of the Southern Common Market becoming an optimum currency zone. Our findings suggest that it would not be rational for MERCOSUR to head in such a direction, and that promoting international trade with MERCOSUR would not produce an optimum currency zone.

Endnotes

1. In Brazil, the inflation rate (consumer price index) was 2,111% in 1994, but 6.0% in 1997.
2. In 1999 as well, Argentina's president proposed introducing a common currency to MERCOSUR.
3. It is said that the crisis began in Russia.
4. We were unable to obtain quarterly data on MERCOSUR trade volumes. Monthly data is also unavailable for trading and other variables. See the appendix for detailed sources of this data.
5. We must note that the sample is very small due to a lack of available data.
6. An example of the first one is Krugman (1979) and of the second one is Obstfeld (1986).
7. In 1994, Canada, Hong Kong, Hungary, Indonesia, Peru, the Philippines and others were also attacked, and in 1997 the Czech Republic, Hong Kong, Hungary, Indonesia, Korea, Malaysia, Mexico, the Philippines, Poland, Singapore, South Africa and others were affected as well.
8. Real GDP or employment would be appropriate; however, we cannot obtain the quarterly or monthly data for this.

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Appendix Sources of the data

Trade: export (Direction of Trade Statistics, IMF)

Exchange rate: Argentina: market rate aa, Brazil: market rate aa, Paraguay: market rate aa, Uruguay: market rate wa. (IFS, IMF)

Unit value of exports: Argentina: wheat 74d.d., Brazil: coffee 74e.d., Paraguay: unit value of exports 74, Uruguay: consumer prices 64 (IFS, IMF)

GDP: GDP 99.b (IFS, IMF)

Consumer Price Index: Argentina: wheat 74d.d. (from 1972 to 1983), consumer prices 64.b. and 64.c. (from 1984), Brazil: coffee 74.e.d. (from 1972 to 1979), consumer prices 64.a.b. (from 1980), Paraguay: consumer prices 64, Uruguay: consumer prices 64 (IFS, IMF)

Interest rate: Argentina: money market rate 60b, Brazil: money market rate 60b, Uruguay: the average of deposit rate and lending rate. The former is 60l, the latter is 60p, Chile: money market rate 60b, Bolivia: money market rate 60b (IFS, IMF)

Domestic product: domestic product 32 (IFS, IMF)

Budget: deficit (–) surplus 80 (IFS, IMF)

Current account: current account 78ald (IFS, IMF)

M2: Quasi-Money 35 (IFS, IMF)

International Reserve: international liquidity (foreign exchange) 1d.d (IFS, IMF)

Manufacturing production: Argentina: Manufacturing production 66, Brazil: wholesale prices 63, Paraguay: wholesale prices 63, Uruguay: wholesale prices 63 (IFS, IMF)

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MERCOSUR AND INTERNATIONAL TRADE

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Summary

In this paper we focus on the Southern Common Market, or MERCOSUR, examining its internal trading activities and scrutinizing the cause of currency crises and the suitability of common currency areas. First we will confirm that the elimination of exchange rate fluctuations has coincided with the increasing volume of international trade. The second purpose of our paper is to analyze the relationship between trade linkages and currency crises. We've found that trade linkages play an important role in currency contagion. If not for the short-term, then at least for the mid- and long-term must we take note of trade linkages alongside macro and financial variables when considering a currency crisis. Finally, we illustrate that increasing trade linkages do not necessarily shape an optimum currency area.